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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - SEPTEMBER 1979

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LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

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STATUS OF PUBLICATIONS

Published

Chess, J.R. 1978. Some procedures for assessing organisms associated with Rocky Substrata. In Lipovsky, S.J. and C.A. Simenstad (Editors), Gutshop '78. Fish Food Habit Studies. Proceedings Second Pacific Northwest Technical Workshop. Washington Sea Grant Publ., Univ. of Washington, Seattle. pp 25-28.

The determination of potential prey availability is important in evaluating predator-prey interactions. A variety of techniques is being used at the Tiburon Laboratory to monitor the density and distribution of potentially available prey species in a variety of habitats: 1) the epifauna associated with rocky sublittoral habitats is being sampled with an airlift suction device, 2) organisms associated with macro-algae and other arborescent growth forms are collected by hand in plastic or fine mesh bags; 3) organisms occurring in the water column are collected by pushing a plankton net over specific habitats; and 40 fishes collected for gut analysis are taken by a variety of spears or quinaldine. Supplemental observations on the behavior patterns of predator and prey species are made along with density determinations.

Approved by Center Director

McConaghy, David C. Measuring sea suface temperature from satellites: A ground truth approach. For publication in Remote Sensing Environment.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Mendelssohn, Roy. A systematic approach to determining mean-variance trade offs when managing randomly varying populations. For publication in Math. Biosci.

Myrick, Albert C. Jr. Some approaches to calibration of age in odontocetes using layered hard tissues. For publication in the Early Life History Symposium Papers.

Owen, R.W. Microscale plankton patchiness in the larval anchovy environment. For publication in the Early Life History Symposium Papers.

Administrative Reports

La Jolla Laboratory

Gruen Gruen & Associates. The California commercial passenger fishing vessel and southern California live bait industries. Adm. Rep. No. LJ-79-31C.

Cowan, Daniel and William Walker. Disease factors in Stenella attenuata and Stenella longirostris taken in the eastern tropical Pacifc tuna purse seine fishery. (Contract #03-78-M02-0146). Adm. Rep. No. LJ-79-32C.

HONOLULU LABORATORY

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS (RADI)

Honolulu Laboratory Scientists Attend Tuna Research Planning Workshop

Dr. Jerry A. Wetherall, Leader of the Tuna Stock Assessment Task; Fletcher V. Riggs, Fishery Biologist; and Marian Y.Y. Yong, Mathematician, attended a Southwest Fisheries Center (SWFC) workshop at San Clemente, California, in September to discuss plans for tuna research in FY 80. In the coming fiscal year the Task will address needs in primarily three areas: (1) development of a tuna fishery data base for the central and western Pacific with a view toward stock assessment and fishery monitoring; (2) summarization of existing statistics on yellowfin and skipjack tuna fisheries in the central and western Pacific; (3) development and analysis of theoretical models for tuna fishery management and stock assessment. In particular, the latter work will consider some generic problems in assessing stocks harvested by both surface and longline gears.

Fishery Resources of American Samoa Under Investigation

Richard N. Uchida, Leader, Insular Resources Task, reported on the early cruise results of the NOAA research vessel, Townsend Cromwell, which left Honolulu on August 18 to begin work on a survey and assessment of insular resources in Samoan waters on September 1. Daily activity messages from Walter M. Matsumoto, Chief Scientist on the Townsend Cromwell, indicate that lobster pots have not produced catches of any significance. Fish trapping, handline fishing, bottom trawling, and surface trolling produced only fair amounts of demersal and pelagic fish. Most frequently caught were blue-line snapper, Lutjanus kasmira, followed by fair numbers of red snapper, L. bohar, other snappers belonging to the genus Pristipomoides, and lethrinids. Matsumoto also reported catching small amounts of deepwater pandalid shrimps, Heterocarpus ensifer and H. laevigatus. Fish aggregation buoys anchored in various preselected locations in American Samoan waters were also monitored during the month. Assisting Matsumoto on the cruise are Research Assistants Paul M. Shiota, Darryl T. Tagami, and Bert S. Kikkawa, and fishermen and scientific personnel from the Office of Marine Resources in American Samoa.

Honolulu Laboratory Biologist Invited to South Pacific Fishery Meeting

Richard N. Uchida has been invited by the South Pacific Commission (SPC) to attend the Eleventh Regional Technical Meeting of the SPC in December as a technical advisor on bottom fish fisheries. In preparation for the meeting Uchida completed drafts of two background papers, "Survey of bottom fish

resources in the Northwestern Hawaiian Islands," and "Current status of fisheries in the Hawaiian Islands." The first paper discusses preliminary results of research on several commercially valuable bottom fish in the NWHI including distribution and relative abundance, fecundity, age and growth, and ciguatera. The second paper discusses recent catch trends, gear development and vessel design in the major Hawaiian offshore and inshore fisheries, and recreational fisheries. Also discussed are fish processing, aquaculture, and the impact of fisheries on State and local economies.

Age and Growth Studies of Fish from the Northwestern Hawaiian Islands Continue

James H. Uchiyama, Fishery Biologist, continued age and growth studies of various species of snappers and the amberjack, Seriola dumerilii from the NWHI. Research Assistants Jose Enitan and Jeffrey D. Sampaga are assisting Uchiyama in aging the fish by reading otoliths. Uchiyama reported that annular marks have tentatively been identified on the rostrum and postrostrum of the sagitta of the pink snapper, Pristipomoides filamentosus. The ages indicated by the annular marks show good agreement with that indicated by daily growth marks.

The von Bertalanffy growth model did not provide a good fit to age data from a sample of seventeen pink snappers between 20 and 72 cm fork length. As suggested by this sample, growth of pink snapper appears to be linear. To determine if a 1:1 relationship exists between age in days and the number of growth marks on the otoliths, Uchiyama made plans to maintain live pink snappers which will be injected with tetracycline.

Studies in the Biology of Fishes From the Northwestern Hawaiian Islands Continue

Researchers in the Insular Resources Task continued studies on the biology of commercially important fishes found in the NWHI. Research Assistant Robert L. Humphreys, Jr. examined the stomachs of 42 amberjack. The most common food items in the stomachs were mackerel scad, Decapterus pinnulatus, octopus, squid and various crustaceans. Humphreys also found parasitic nematodes and trematodes in a large proportion of the stomachs.

Research Assistant Linda C. Hubbell worked on a study of the reproductive biology of amberjack. Based on the multimodal distribution of ova diameters, Hubbell tentatively concluded that amberjack are probably fractional spawners. She also isolated several probable parasites, tentatively identified as copepods, and orange, oily deposits in the ovaries. The deposits were sent to Dr. Y. Hokama, Pathologist, at the University of Hawaii John A. Burns School of Medicine, for ciguatoxin analysis.

Research Assistant Bernard M. Ito continued to sample amberjack for ciguatera studies at the United Fishing Agency. During the period August 27 to September 21, 76 amberjack ranging in weight from 0.57 to 30.39 kg were sampled. Two (3%) of the fish turned out to be borderline in toxicity in the radioimmunological assay (RIA) test and were rejected.

Isopods From Seabird Spewings Identified

Thomas S. Hida, Fishery Biologist, reported that several large isopods found in the spewings of Laysan albatross, Diomedea immutabilis, were identified as Anurops branchiatus, by Dr. Thomas Bowman of the U.S. National Museum. Bowman noted that of the four known species of Anurops, two are known only from seabird stomachs. He also mentioned that most of the crustaceans from seabird spewings that were sent to him for identification were, interestingly, bathypelagic rather than near-surface forms.

Hida also identified several interesting items in the diet of the white tern, Gygis alba, including several juvenile billfishes and other fishes tentatively identified as Macrorhamphosus gracilis, Gregoryina gygis, and Gonorhynchus gonorhynchus.

NWHI Ecosystem Data Evaluated

Dr. Jeffrey J. Polovina, Statistician, met with researchers studying various components of the NWHI ecosystem to evaluate the input data being generated for the biomass model developed by Dr. Taivo Laevastu of the NMFS Northwest and Alaska Fisheries Center. Polovina hopes to have sufficient data within a month to attempt preliminary runs in Seattle so that the ecosystem model can be evaluated.

Albacore Catch Sampled for Determination of Size Composition

In cooperation with the Coastal Fisheries Resources Division, SWFC, Humphreys and Hubbell measured 150 albacore, Thunnus alalunga, from the catch that was offloaded in Honolulu by the fishing vessel, Captain Vincent Gann. The Captain Vincent Gann was under contract to serve as a mother ship for the albacore trolling fleet that operated north of Midway Islands from April to August.

Hawaiian Skipjack Tuna Landings Continue Below Long-Term Average

The September 1979 Hawaii landings of skipjack tuna were estimated at 156.0 metric tons (MT), which is 3.1 MT below the September 1978 landings and 229.0 MT below the 1948-78 long-term average for September. The cumulative landings from January through September were estimated at 2,528.8 MT, which is 23.9 below the 1978 landings for the same period and 1,178.2 MT below the 1948-78 long-term average for the same period.

FISH-ENVIRONMENT INVESTIGATIONS (FEI)

Experiments to Induce Tuna to Spawn Continue

Dr. Andrew E. Dizon, Leader, Experimental Ecology of Tunas Task, reported that Research Assistant Sharon Hendrix is continuing the work begun by Dr. Calvin M. Kaya, Montana State University, to induce tunas to spawn through hormone treatments. Hendrix continued biopsies of kawakawa, Euthynnus affinis, to monitor the development of ovarian ova. The biopsies showed a slight decrease in the mean diameter of the ova from August to September (Table 1).

Table 1

	Mean Ova Diameters (mm)	
	August	September
Tank D	0.180	0.165
Tank F	0.200	0.180

However, one female in Tank D had ova that increased in diameter from 0.30 mm in August to 0.49 mm in September. As in August, the September biopsies showed no viscous milt in the sperm ducts of male kawakawa.

In an ancillary experiment, an attempt was made to determine whether the kawakawa could be adapted to a new form of food presentation. The kawakawa in Tank F (experimental group) were fed ground up or whole smelt stuffed in sausage casings and the fish in Tank D (control group) were fed the daily ration in the usual manner. The experimental fish fed on the sausages for only 2 weeks, suggesting that the fish were not amendable to this method of food presentation. The kawakawa in Tank F are also receiving a 25 mg/fish/day supplement of vitamin B (triamine hydrochloride).

Skipjack Tuna Oxygen Uptake Rates Recomputed

After applying correction factors developed by Dr. Daniel Weihs during his recent stay at the Honolulu Laboratory, Reginald M. Gooding, Fishery Biologist, reanalyzed oxygen uptake rates of skipjack tuna measured by laboratory respirometers. Weihs' study shows that fish forced to swim in a small radius (relative to fish length) are subject to the centripetal force required for continual swimming in a curved path, and to increased drag forces which would not be continually encountered by wild fish. Oxygen uptake rates measured in the laboratory showed skipjack tuna's metabolic rate to be two to five times that of nontunas of similar size, indicating that it is relatively inefficient in its use of oxygen and food-energy for swimming. However,

correction of the oxygen uptake values of skipjack tuna swimming in a curved path to that which may be more accurately approximated for skipjack tuna in the wild indicates that skipjack tuna is probably one of the most efficient oxygen-energy users of all fishes at all swimming speeds.

Regression analysis of oxygen uptake rate (mg O_2 $g^{-1}h^{-1}$) relative to fish weight (W) in grams, and speed (S) in body lengths S^{-1}, for the uncorrected data yielded the relation:

$$\log \text{oxygen uptake} = -1.2012 + 0.1911 \log W + 0.2131 S.$$

When Weihs' correction factors are applied to the oxygen uptake rates, the following relation is obtained:

$$\log \text{oxygen uptake} = -1.3032 + 0.0382 \log W + 0.1759 S.$$

Because larger fish, relative to smaller fish swimming within the same tight curvilinear path, expend an even greater proportion of energy, the weight exponent in the second equation has been reduced to a value far more consistent with other fishes. On the basis of this new input, the manuscript on skipjack tuna oxygen uptake is being revised. Weihs was the NRS-NOAA post-doctoral fellow at the Southwest Fisheries Center in 1978-79 and is an Associate Professor at Technion, Haifa, Israel.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES

Paper on Potential Oceanic Remote Sensing Applications to North Pacific Fisheries by the SWFC Presented at NOAA Workshop

Dr. R. Michael Laurs, Leader of the Albacore Fisheries program at the La Jolla Laboratory, represented the Center at the NOAA Workshop on Oceanic Remote Sensing held at Estes Park, Colorado on August 20-24, 1979. Laurs, who reported that the Workshop was exceedingly useful and productive, presented a paper there on potential oceanic remote sensing applications to fisheries in the North Pacific by the NMFS Southwest Fisheries Center. Because of its interest and timeliness and because it provides a view of past research efforts by the SWFC, the following remarks have been excerpted from Laurs' paper:

Satellite oceanography activities have been underway at the NMFS Southwest Fisheries Center since the late 1960's. Early efforts involved the use of imagery received on Automatic Picture Transmission for use in fishery advisories issued to fishermen and for research and development in the quantification of infrared measurements of sea surface temperature. At present, the primary objective of ocean satellite remote sensing efforts at the Center is the evaluation of the feasibility of the application of ocean measurements made from satellite to fisheries research and fisheries management. Specific activities underway include generation of quantitative maps of sea surface temperature from selected passes of polar-orbiting satellites for use in fisheries research studies off California, demonstration of the use of SEASAT-A data in fisheries case studies involving tuna, and operation of a "SEASAT-A" real-time ocean product distribution system to commercial users in cooperation with NASA through the Jet Propulsion Laboratory. Related satellite studies have been in the tracking of drifter buoys and in plans made for the tracking of marine mammals.

Ocean satellite remote sensing can play an important role in fishery research and fishery management by providing ocean measurements for use in evaluating environmental effects on the abundance and availability of fishes for use in the assessment of the status of fish populations. The greatest success in the application of ocean satellite remote sensing to fishery science will doubtless be in those cases where there is sufficient understanding of fishery biology and physics to identify key oceanographic processes that influence a fish species in question.

Specific examples of species in the North Pacific where adequate fish-ocean relationships are known and where measurements from satellites could be

of great assistance include the Pacific mackerel, northern anchovy, and North Pacific albacore.

Work by Dr. Richard Parrish at the Pacific Environmental Group of Monterey, California, associated with the Center, has shown that when sea level and ocean surface layer transport data are used in conjunction with classic fishery population dynamics models, about 60% and 76%, respectively, of the variance between predicted and observed population levels of Pacific mackerel are accounted for, whereas when population dynamics models are used alone, only 17% to 30% of the variance is accounted for. In the case of Pacific mackerel, transport of eggs and larvae by ocean circulation to favorable or unfavorable areas for survival is a key factor in determining the recruitment of a given age class. Satellite measurement of winds for determination of the stress of the wind curl and surface layer and ocean transport has immediate application in determinations of population biomass estimates for Pacific mackerel and other fish species in the California Current where ocean transport of eggs and larvae affects survival.

Ocean measurements made by satellite can also have immediate application in studies on survival of the year class of northern anchovy. Dr. Reuben Lasker, Leader of the Coastal Fisheries Resources Division and his co-workers at the La Jolla Laboratory, recently established the threshold number of food particles needed for feeding by larval anchovy, the necessary size of the food particles, and the horizontal and vertical distribution of suitable particles required in the environment of the larva to insure survival. Results from the studies on the distribution of first-feeding larval anchovy and their food has led Lasker to hypothesize that the upper mixed layer of the ocean where anchovy spawning takes place must be in a stable (non-turbulent) state for survival of sufficient/anchovy larvae to insure the production of a good year class. Turbulent ocean conditions in the upper mixed layer destroy food aggregations and dilute potential food organisms to below threshold concentrations needed by first-feeding larval anchovies. Satellite measurements of wind speed and direction, wave height, ocean color, and sea surface temperature to determine turbulence would be of great utility in estimating year-class survival in the northern anchovy.

Albacore tuna is another example of a fishery resource in the North Pacific where ocean satellite remote sensing can make significant contributions to fishery science fishery management. The North Pacific albacore is a highly migratory species that makes transoceanic migrations and is fished by several countries. Environmental data measured by satellites in conjunction with data sources (in the mid-Pacific ocean area satellite measurements will provide the only environmental data available on a routine basis) will be used in determinations of North Pacific albacore distribution, migration routes, and availability. This information, incorporating environmental effects, will play a vital role in the international management of this resource which will probably occur in the near future.

Recent albacore-oceanography and albacore biology studies conducted at the La Jolla facility under the direction of Laurs have shown that there are two substocks of albacore in the North Pacific and that each substock has a separate and different migration pattern. The "northern" substock migrates

back and forth between the eastern North Pacific off the Pacific Northwest of the United States, north of Cape Mendocino (40° N) and the western North Pacific off the Japanese home islands. The "southern" Japanese home islands. The "southern" substock migrates back and forth between waters off the coast of California and Baja, California south of Cape Mendocino and waters somewhere in the central North Pacific.

Laurs and his colleagues have demonstrated that migration patterns of the albacore are associated with the oceanic frontal structure of the North Pacific Transition Zone, and that the albacore distribution, availability, vulnerability, and relative abundance in coastal waters of the eastern Pacific where the U.S. fishery occurs, are greatly influenced by oceanic fronts resulting primarily from coastal upwelling. Laurs has also concluded that variations in oceanographic conditions in the western North Pacific influence the timing of the migration of the "northern" substock from the western Pacific to the eastern Pacific. When certain types of eddy and frontal conditions are present in the Kuroshio current and Kuroshio extension waters, the onset of the albacore emigration from the Western Pacific is such that fish arrive in Pacific Northwest coastal waters during summer months when ocean temperatures are within the optimal temperature preference of albacore, and the U.S. fishery in their waters is usually successful.

When other types of eddy and frontal conditions occur in the western Pacific, however, the onset of emigration is delayed and the fish do not have sufficient time to migrate across the North Pacific to waters off the Pacific Northwest before the waters there cool below the optimal temperature preference for the fish. In years when this occurs the U.S. fishing success in Pacific Northwest waters has been low.

Satellite monitoring of oceanic frontal and eddy conditions in the Kuroshio Current off the Japanese home islands, in the Kuroshio Extension waters, of the Subarctic and Subtropic fronts of the North Pacific Transition Zone, and of upwelling and other oceanic fronts in coasal waters of the west coast of North America would markedly assist in the development of alternative strategies for eventual international management of this important fishery resource. Ocean color measurements by the NIMBUS CZCS appear to hold the greatest promise for monitoring the ocean frontal conditions in question. In addition, remote sensing of sea surface temperature and surface winds and waves are important.

* * * * * * * * * *

Ken Bliss, Oceanographer, departed Kodiak, Alaska on September 17 aboard the NOAA vessel Surveyor. This September cruise was an endeavor to measure the seasonal change in the subarctic and subtropic ocean fronts at a time when the near-shore albacore fishery is in progress. Upon leaving Kodiak enroute to the survey area, XBT's and albacore trolling operations were conducted where sea surface temperature were favorable (14° C to 22° C). Beginning at 40° N 144° W, XBT's and fishing operations were curtailed and a series of 1000 meter CTD's were conducted at 30 nm intervals between 40° N and 29° N latitude along meridians 144° W and 137°30'W. Subsequent to CTD operation, XBT's and

trolling operations were resumed enroute from the survey area to Seattle, Washington.

Bliss reports that all systems worked very well and that the Captain and staff of the Surveyor gave full cooperation in attaining cruise objectives. A total of four albacore were caught on jig lines to the north and northeast of the CTD survey area. As expected sea surface temperature within the survey area was generally too warm for effective albacore trolling. The November cruise will use vertical longlines to test for albacore at deeper levels.

This survey provided valuable findings that Ron Lynn has incorporated in the planning for the November albacore oceanography cruise aboard the David Starr Jordan. High salinity subtropical waters and the ocean fronts were found to have penetrated farther north than noted previously. The development of a strong shallow summer thermocline allows the upper 50 meters or so of the ocean fronts to be divorced from the deeper portion of the fronts. The surface layer manifestation of the subtropic front had shifted 40 to 50 nm northward relative to its position between 50 and 200 meters. The subarctic front was found to be poorly developed with its surface position 60 nm north of earlier findings. The cruise track for the Jordan will repeat portions of the two Surveyor transects and will concentrate on the subtropic front. The longlining operations will be attempted in regions about both the shallow and the deeper portions of the front. The data collected aboard the Surveyor as well as the data to be taken aboard the Jordan will be used in studies of seasonal changes in the development of the ocean fronts.

LARVAL FISHES, COASTAL EAST PACIFIC

Temporal Pattern of Spawning and Sexual Composition of Anchovy Schools Described from Histological Examination of Ovaries

Dr. John Hunter, assisted by Technician Bev Macewicz of the University of California, San Diego, described the temporal pattern of anchovy spawning based on the occurrence of females with hydrated ovaries and ones with new post-ovulatory follicles using data collected in 1979 together with information collected in 1978. They also related the occurrence of these two stages to the sexual composition of schools.

The seven trawl samples taken during a single night in the same locality (March-April 1979) provided an illustration of the temporal pattern of spawning within a single group of schools. The percent of females with hydrated eggs decreased from 10% at sunset to zero by midnight, whereas the number of females with new post-ovulatory follicles increased sharply at 2100 and varied between 25 and 35% of the females throughout the rest of the night. The incidence of new post-ovulatory follicles in this series was consistently higher than the mean of all collections taken in March-April 1979 (13%). Thus, on this particular night, more spawning may have occurred in this group of schools than was typical for all schools in the Los Angeles Bight in March-April. The average frequency of day-old post-ovulatory follicles was 9%, close to the average (10%) for the March-April survey period as a whole.

The temporal pattern of spawning for all surveys combined (February 1978, January-February 1979 and March-April 1979) was similar to the one for a single night. The percent of anchovy females with hydrated eggs declined from about 14% at sunset to 0 at 0100. The occurrence of females with new post-ovulatory follicles increased sharply at 2100 hours and varied between 10-15% throughout the rest of the night. These combined data reveal two additional patterns not resolved in smaller samples sizes: a reappearance of females with hydrated eggs around 0500-0600 and the occurrence of females with both hydrated eggs and new post-ovulatory follicles. The reappearance of females with hydrated eggs indicates that hydration for the next night of spawning began in the early morning. The process probably continued throughout the day, resulting in females being ready to spawn at sunset. This view is supported by the fact that histological examination of hydrated ovaries collected between 0500-0600 h indicated that they were in the early stages of hydration.

The best indicator of the time of spawning may be the occurrence of females with both hydrated eggs and new post-ovulatory follicles because these females were caught while spawning. Their low frequency in the collections (5%) indicates that spawning was completed rapidly and the time of occurrence indicates the period of maximum spawning occurred between 2100 and 0200 h, with a peak between 2200 and 2300.

On the basis of these results, nightly pattern of spawning in anchovy can be divided into three periods: early spawning period (1800 to 2100 h), some spawning occurs but the ovaries of most reproductively active females are in the hydrated state, maximum spawning (2100-0200 h), most females spawn (females with hydrated eggs decline to 0 and females with new post-ovulatory follicles reach the maximum for the night), and post-spawning (0200-0600 h), little or no spawning occurs (females destined to spawn the next night begin hydration). This spawning pattern agrees with one described from the occurrence of staged anchovy eggs by Dr. Paul Smith of the La Jolla Laboratory.

Past work indicated that the occurrence of females with hydrated eggs and new post-ovulatory follicles decreased with an increase in the proportion of females in the school (Hunter and Goldberg, 1979). We re-examined this relation using the combined data from all surveys. In this analysis the proportion of females (females/males + females) in the school was used as a measure of the school sex ratio and the occurrence of females with hydrated eggs combined with those with new post-ovulatory follicles was used as a measure of the reproductive activity of the school.

In schools composed of nealy all males (sex ratio 0.1), over 40% of the females were reproductively active on the night of capture. The proportion of reproductively active females was high (20-25%) for schools having a sexual composition of 40% or fewer females, but was only about 15% for schools composed of 50% or more females. Hunter and Goldberg (1979) suggested that the reason for male dominance in reproductively active schools was that a female was courted by many males. If this were the case, one might expect that the variability in sex ratio of schools might change with time of day and spawning. In other words, the variance in sex ratio would increase as fish separated into male and female dominated groups in preparation for spawning or

during spawning, and decrease after spawning. To test this hypothesis, Hunter and Macewicz arranged the combined data for 1978-79 into 1-hr. time of day classes and calculated the standard deviation sex ratio of schools within each class. The standard deviation of the sex ratio of schools followed the temporal pattern of spawning: greatest variability occurred during the period of maximum spawning, lowest during the early spawning and post-spawning periods. Thus variation in sex ratio of anchovy schools appears to be part of the temporal pattern of reproductive behavior.

Histochemical Tests Performed to Carbohydrate Identification of Starving Anchovy Larval

Dr. Charles O'Connell, assisted by Fishery Biologist P. Paloma, reported completion of histochemical tests of fed and starved anchovy larvae reared in the laboratory to determine glycogen level in the liver. Similar tests were started on ocean-caught anchovy. The purpose of the work is to corroborate previous identification of starving larvae based on histological analysis, and to seek unequivocal one-factor tests of the starving condition. Glycogen is the form in which carbohydrates are stored in the liver. Carbohydrates are the most readily available of the energy reserves, they are also the first affected by depletion. One hundred twenty-seven specimens were processed by the Periodic Acid-Schiff (PAS) reaction which intensely stains glycogen.

Results with laboratory reared material were clear cut, according to O'Connell & Paloma. For ages 3 to 26 days approximately 80% of fed larvae had high liver glycogen, while 67% of starved larvae had low liver glycogen. Among the starved larvae glycogen level varied with age, size and duration of starvation. The few larvae so far tested from the earlier special sea samples, which had been carefully fixed in Bouin's solution at sea, responded well to the PAS procedure. They were from samples containing anchovy larvae that had been judged healthy by histological standards, and all showed high or medium levels of liver glycogen. Larvae from samples judged emaciated by histological standards are now being prepared for the PAS procedure. A small number of anchovy larvae from recent CalCOFI tows have also been tested, and they disintegrated under the PAS procedure. Additional specimens will be tested, but more than likely routine formalin fixation will prove to be inadequate for the PAS treatment.

Experiments Indicate Container Size is Important Variable in Larval Fish Rearing in Laboratory

At the La Jolla Laboratory, Fishery Biologist Gail Theilacker has been studying the morphology and nutritional condition of jack mackerel, Trachurus symmetricus, larvae reared in 10 liter (1) and 100 (1) laboratory containers. Usually, the use of small containers instead of large containers for rearing larvae is preferable for larval fish experiments in the laboratory. With small containers fewer food organisms are required, treatments can be easily replicated, less space is required, and survival of larvae can be monitored i.e., dead larvae are visible on bottom of shallow containers and can be removed).

Theilacker's study demonstrated that the growth of jack mackerel depends on space available in tanks, and that the disparity in growth rates of jack mackerel whether reared in large or small laboratory containers began at an early age. All body measurements (standard length, head length, eye diameter, body depth at the pectoral, and body depth at the anus) of fed larvae were greater on each sampling day in the 100 (1) container than in the 10 (1) container. These differences in larval sizes, however, were not significant until after Day 9 when the larvae had been eating for four days. In the starved treatments, larval size differences in small and large containers were significant on Day 8, after the larvae had been starving for three days.

Nutritional condition of fed larvae reared in large and in small containers was similar for five feeding days, until Day 10. On Day 10, larval condition was significantly better in the large container, fewer larvae were "starving" in the large container than in the small container, i.e., 7% versus 50%.

It has thus been shown that jack mackerel larvae reared in 10 liter containers were smaller and in poorer nutritional condition than were larvae reared in 100 liter containers. It is evident that container size is a variable that must be considered with temperature, light, food type and availability, and stocking density in the conduct of larval fish rearing experiments in the laboratory.

Biological Technician Jack Metoyer assisted in measuring the larvae. Susan Picquelle performed all of the statistical analyses.

Analysis Indicates Feasibility of Estimating Relative Survival of Each Month's Spawn

After completing work on the birthdate distribution of the 1978 anchovy cohort, Richard Methot, Scripps Institution of Oceanography graduate student at the La Jolla Laboratory, suggests that monthly quantitative surveys of anchovy spawning intensity followed by analysis of the juvenile cohort's birthdate distribution permit an estimate of the relative survival of each month's spawn. Timely prediction of poor recruitment may be made if the larvae produced during a peak spawning month are not abundant as juveniles 4 months later. As a time series of such studies is accumulated, the causes of differential larval survival within, and hopefully, between years will become apparent. An analysis of this sort was first attempted on the 1978 anchovy year class. Spawning was greater in January than in April but most of the prerecruits were born in March and April. This result will be presented at the 1979 CalCOFI Conference.

The determination of birthdates also produces data on the entire growth history of each individual. Preliminary analysis of this data from the 1978 cohort indicates that individuals born early in the spawning season had slower late larval growth rates than individuals born after February, and the growth rate of all juveniles slowed drastically in October-January. The risk of early spawning may be unpredictable winter storms, but the risk of late spawning is poor growth during the late autumn; a condition which might be exacerbated by competition with abundant 1- or 2-year-old fish. Continued

analysis of birthdate distributions and seasonal patterns of growth and condition (fat content) will test these hypotheses.

Methot coordinated cruises in June, August and September 1979 to collect anchovy in the Southern California Bight. Thanks to the suggestions and efforts of Jerry Jurkovich, Bill Flerx and Dan Kulusich, the efficiency of the midwater trawling operation was greatly improved. Peak catch rate was 1600 lbs/30 min. tow. The length distributions suggest that fish of the 1978 year class were most abundant but quantitative comparison to the 1979 year class will be difficult because the juveniles were highly concentrated nearshore of the 50 fathom isobath.

John Sunada (CF&G) will analyze annual growth marks in otoliths to determine the age composition of the adults. Carol Kimbrell is determining the fat content of juveniles and adults. Susan Longinotti and Richard Methot will determine the birthdate distribution and growth rates of juveniles from daily growth increments in otoliths. This analysis of the 1979 year class will be easier than for the 1978 year class. Because the fish were sampled earlier in the year, the otoliths are smaller and therefore easier to prepare and read. An analog-digital video converter recently added to the otolith microcomputer by Jack Brown will permit automation of some of the counting. Finally, statistical analysis on the 1979 trawl samples will be easier than the 1978 bait fishery samples.

Most of the data required for the description of the birthdate distribution will come from the August-September collections, but inclusion of summer spawned fish, studies on growth and condition during the potentially critical late autumn, and comparison of abundance to earlier year classes require later samples. Two well-timed surveys, the CF&G sea survey scheduled for early November and the late winter cruise on the R/V Oregon, will provide these samples.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION

XBT Digitization System Tested Aboard Jordan

The participation of the SIPPICAN Corp. on Jordan Cruise DS79-07 (127) in September provided an opportunity to test the XBT (expendable bathythermograph) digitization system designed around the HP9825A minicomputer, according to Larry Eber, Oceanographer. The latter is used aboard the Jordan for processing and storing data from CTDO (conductivity/temperature/depth/oxygen) instruments. For digitizing XBT data, an analog output from the XBT recorder is fed through an analog to digital converter and into the HP9825A computer where the digital values, which represent voltages, are converted to temperatures and stored on magnetic tape cartridges. Prior to sailng, Mark Sweeney, Communications Specialist, completed the electrical connections between the XBT recorder and the analog to digital converter, which is a peripheral unit for the HP9825A, and assisted in the preliminary checkout of the system. Ken Bliss wrote the computer program for controlling the operation and handling the data, and also took part in checking out the system. At sea, the tests were conducted by Dr. Paul

Smith and Larry Eber, assisted by Nelson Ross, Environmental Data Service and Donna Mallicoate (NMFS/PEG/Monterey) in cooperation with four Sippican technicians. The technicians came equipped to carry out quality control tests with several hundred probes, which were to be launched in pairs, simultaneously, from launchers mounted on either side of the vessel. The XBT digitization system was especially adapted to record the data from both probes in each pair.

During the tests, digitized data were successfully recorded from 169 pairs of 17 (750 meter) probes and 16 pairs of T5 (1830 meter) probes. A preliminary evaluation of the system has been made by comparing the digital output of the computer with temperatures read from the analog charts for a few selected depths. The comparisons were made with samples of 20 casts from each launcher (port and starboard). The results are summarized in the following table which lists the mean difference and standard deviation for each depth. A positive difference indicates that the digitized values were greater than the corresponding chart values.

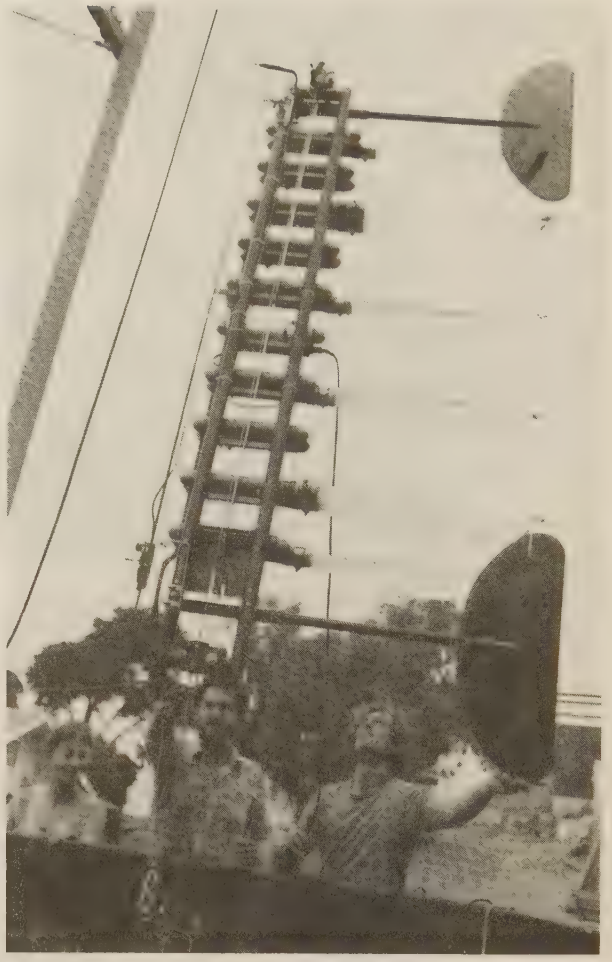
Time from launch (sec)	Depth (meters)	Port Launcher Mean Diff. °C	Port Launcher Stan. Dev.	Starboard Launcher Mean Diff. °C	Starboard Launcher Stan. Dev.
4.75	30.7	+ .249	.836	+ .055	.206
9.50	61.2	- .060	.082	- .041	.097
23.75	152.4	- .075	.056	- .111	.064
38.00	242.8	- .003	.091	- .064	.067
52.25	332.4	+ .056	.097	- .003	.113
66.50	421.2	+ .021	.065	+ .022	.096
80.75	509.3	+ .035	.054	+ .031	.086
95.00	596.5	+ .079	.074	+ .023	.063
109.25	682.9	+ .104	.083	+ .078	.091
118.75	740.1	+ .141	.072	+ .119	.108

The excessively large values of mean difference and standard deviation at 30.7 m result from sharp vertical gradients (up to 1° C/m) occurring at that depth, combined with imperfect positioning of the XBT recorder stylus on the chart. The latter effect is negligible below the thermocline. The remainder of the table reveals a bias in the differences such that the digitized temperatures are lower than those read directly from the analog charts at relatively shallow depths, and higher at deeper depths. The reason for the bias is not known. The magnitude of the differences appear to be reasonably small.

Fishery Biologist Carol Kimbrell inserts paired plankton nets on Micro-Patch Sampler (MPS) prepared for statis testing in the Deep Tank Facility of the Scripps Institution of Oceanography.

The Micro-Patch Sampler being launched from the David Starr Jordan at sea. The instrument is used to sample larval fish food and measure various factors of their environment. The vanes are needed to orient the sample tube mouths upstream. (Photo credit Rich Charter)

Micro-Patch Sampler is immersed in the Deep Tank by Brown while Carol Kimbrell takes observations. The messenger weights above the trigger actuate the sampler to close sample bottles and open and close the nets at depth.



Lee Inness-Brown, Technician, rigs actuation weights on Micro-Patch Sampler as Carol Kimbrell and Dr. Robert Owen watch. Note the close spacing between the sampling tubes. The trolley-mounted thermistor used for temperature microprofile is visible at the lower left side of the MPS frame.

Owen has found that microlayers are evident in both motile and non-motile phytoplankton, small zooplankton, detritus and nutrients and are partly accounted for by purely physical processes. Variations in concentration of these substances suggest that the ocean at rest is quickly divided into microniches of less than one meter in extent by phytoplankton and that the smaller zooplankton (at least those sampled by Owen's apparatus) respond in kind. Thus an oean region not only may contain higher local concentrations of larval fish food than previously thought but can also sustain more types of organisms through reduction of competition by centimeter-scale space allocation of resources.

MULTISPECIES TAXONOMY

Yellowfin Croaker Spawned in Captivity for First Time

Dr. G. Moser reports significant progress this month in the larval rearing project. Moser & John Butler with the help of Roger Leong spawned a yellowfin croaker, Umbrina roncador, for the first time. About 15 fish were collected over the summer by student employee, Morgan Busby. The fish were examined on September 18 to determine state of gonad maturation and injected with gonadotropin P.M.S. On September 19, one female and one male were running ripe and the eggs were stripped and fertilized 32 hours after injection. Viable eggs were sorted with the help of Susan D'Vincent, Barbara MacCall, Elaine Sandknop and Betsy Stevens. Yolk-sac larvae are remarkably similar to those of the corbina, Menticirrhus undulatus and later stage larvae are similar to those of the black croaker, Cheilotrema saturnum. Umbrina is the seventh croaker species to be reared by Butler and the staff of the Multispecies Taxonomy Program over a 2-year period. The resultant information on the early life history of these important sport and food fishes is crucial for inshore ichthyoplankton studies.

Moser also noted that a complete developmental series of the spoted sand bass, Paralabrax maculatofasciatus, was reared from field collected eggs. All three California species of Paralabrax have now been reared in the aquarium and Butler is presently preparing a manuscript describing the development of larvae and juveniles with Moser and two USC students as co-authors.

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Susan D'Vincent and Betsy Stevens worked on their presentations for the upcoming CalCOFI conference. D'Vincent is preparing a description of the early life history of the Pacific butterfish, Peprilus simillimus, and Stevens will present information on the reproductive biology and development of Hypsoblennius.

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Dr. Moser attended a workshop September 17-19 on the potential impact of wastes from manganese module processing in Bethesda, Maryland, sponsored by the Marine Minerals Office of NOAA. On his return trip he stopped at West Yellowstone, Montana to deliver a paper at the annual meeting of the American Fisheries Society, September 20-21, entitled, "Characters useful in

identification of pelagic marine fish eggs," by Ahlstrom and Moser that was to have been presented by the late Dr. Ahlstom.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Anchovy Mortality Rate Reviewed

Doyle Hanan, CF&G Marine Biologist on detail to the Southwest Fisheries Center's Coastal Division, re-estimated the total mortality rate of anchovies (Engraulis mordax) using age composition samples taken by the CF&G vessel, Alaska. The previous mortality rate estimate used trawl catches taken on the Alaska from 1966 to 1971, whereas the new study updated the coverage to 1978. The new estimate of total mortality rate (65.1 annually) is very near the earlier estimate, helping to confirm the estimate in light of variability of year-class sizes. There has been no apparent increase in total mortality rate despite increased U.S. and Mexican harvests.

Anchovy and Jack Mackerel Plans Modified

Dr. D. Huppert, Program Leader, reports that at a September 12 meeting in Long Beach, the Plan Development Team and Advisory Subpanel discussed an amendment to the Anchovy Plan and an additional option for the Jack Mackerel Plan. The Advisory subpanel voted unanimously to recommend that the Pacific Fisheries Council adopt the following procedure for reallocating the reduction fishery quota between the northern and southern permit zones: On May 15 (or June 1) of each fishing year, the northern area allocation of 10% or 10,000 of reduction fishery quota, whichever is less, will be suspended. Any reduction fishery quota remaining after that date may be taken north or south of Pt. Buchon.

The other more complicated methods of mid-season reallocation of the quota were rejected by the subpanel. Also, the subpanel did not recommend that the nonreduction allocation be altered.

A new option for optimum yield (OY) in the Jack Mackerel Fishery Management Plan was developed by the Advisory Subpanel. The OY would begin at 60,000 short tons/year and would increase by 5,000 ton increments if the fishery takes the full OY in the preceding years. Otherwise, OY will remain at the same level. The entire Plan would be re-examined when the fishery reaches 100,000 tons. This option provides definitive criteria for increasing the quota, and should prove legally acceptable. As has become customary, Economist Jane McMillan ably revised the Regulatory Analysis to reflect, after the fact, decisions made by the development team and subpanel.

Analysis of Aerial Spotter Data Prepared

In an attempt to extract an abundance index for anchovies from the Aerial Marine Resources Monitoring System data, Susan Picquelle, Statistician, has constructed an analysis of covariance model to apply to that data. The independent variable will be the logarithm of the tons sighted for each flight by region. The covariates will be log (time in air for each flight by region) and log (distance flown for each flight by region), which are taken to be measures of effort. The relevant factors are hypothesized to be region,

season, time, pilot and year, with possible interactions occurring among these. The year effect will be considered to be an index of abundance of anchovies.

In order to define the factors, region and season, a preliminary analysis of the sighting data has been performed with the help of Joe Caruso, Computer Programmer. The number of sightings and the number of tons have been broken down by block number, month, and year. Based on this information, the blocks will be grouped to form homogeneous regions and months will be grouped to form meaningful season, hopefully removing some of the arbitrariness typically associated with these factors.

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Picquelle has also analyzed two sets of data for Fishery Biologist Gail Theilacker, which examine the effect of container size on her experimental larvae. The analyses indicate that by the ninth or tenth day, the difference in container size can have a significant effect on the growth and condition of the larvae.

Fishing Vessel Investment Study Progress

Jane McMillan, Economist, reports progress on the NMFS study of fishing vessel construction in the United States. McMillan developing an investment model to examine the trends in fishing vessel construction by fishery and area. Data on number of vessels built and participating in various fisheries for the years 1965 to 1977 are available from NMFS and Coast Guard data files. A telephone survey of 217 boatyards provided data for 1978, 1979 and estimates of construction for 1980. McMillan travelled to Washington, D.C. this month to work with NMFS staff on this project.

Preliminary results from the telephone survey indicate that construction of fishing vessels has increased significantly since 1976.

Year	Number of vessels built[1]	Number of boatyards
1974	864	-
1975	556	-
1976	706	-
1977	1,183	-
1978	2,366	178
1979	2,958	209

[1] Source: 1974-1977 Coast Guard data on construction of fishing vessels over 5 net tons.
1978-1980 NMFS telephone survey of boatyards which have built or anticipate building commercial fishing vessels over 20 ft.

Forty percent of the newly-constructed vessels will participate in West Coast fisheries, fifteen percent in the Gulf, and twenty-two percent in the East Coast, and for the remainder the destination was unknown. Vessels were destined more for Alaskan waters (26%) than for any other area. Further detailed analysis on these will be carried out in the coming month.

While meeting with NMFS staff in Washington, D.C., McMillan became familiar with several NMFS data files which could be useful to other NMFS researchers, two files in particular were valuable. The Vessel Operating Units file contains data on vessel characteristics for all vessels participating in U.S. fisheries. Data items include: vessel number, type of gear, tons, length, horsepower, year built, construction type, rig, crew, year, state, county and area. The General Canvas File contains aggregate landings data with the following data items: gear type, species, pounds, value, year, area, state and county.

Center Scientists to Assist NMFS Stock Assessment Task Force

Dr. Gary Stauffer, Fishery Biologist, is organizing the SWFC portion of the NMFS Stock Assessment Task Force Report which is chaired nationally by Dr. D.L. Alverson, Director of the Northwest and Alaska Fisheries Center. The Task Force report will be an internal evaluation of NMFS capabilities for stock assessment. For the SWFC portion, four assessment methods will be examined: (1) aerial surveys for monitoring pelagic species, (2) systematic aerial survey for estimating abundance of marine mammals, (3) egg and larva surveys methods, and (4) sonar mapping. Dr. Rennie Holt, Fishery Biologist, will contribute to the second of these reports. Also, Dave Mackett, Planning Officer, will prepare a review of current Center activities, and Director I. Barrett will be personally involved in an evaluation of the "proper mix" of science in stock assessment. The SWFC contribution will be completed by October 10.

Blue Rockfish Most Abundant Species Sampled on Cruise

From September 4 to 8, John MacGregor led a rockfish cruise to offshore banks aboard the research vessel, David Starr Jordan. Samples of rockfish were collected at Cortez Bank and from several localities around San Nicholas Island for age and growth studies. As on the May-June cruise, blue rockfish were the most abundant species sampled. Most of the sampling was by hook and line, and a few rockfish were taken by bottom trawl. Two hauls were made, on the second run, the cod end of the trawl was torn by a large rock, releasing most of the catch.

Israeli Scientist Completes Research Year At Center As NRC-NOAA Post-Doctoral Fellow

Dr. Daniel Weihs, Associate Professor of Aeronautical Engineering at Technion, Haifa, Israel, completed a year of research at the Southwest Fisheries Center on August 14 under the sponsorship of a National Research Council-NOAA Post-Doctoral Fellowship. Although Weihs is not a fishery biologist, he has long maintained an interest in the physical and hydrodynamical aspects of fish locomotion. The excellent aquarium facilities and abundance of material at the Center have permitted him to concentrate his talents during the past year on larval fish swimming and other related matters.

Weihs' first project was to compare the radically different swimming mode of the larval anchovy with that of the adult, in order to establish the reason for this difference. He found that larvae use continuous swimming because of the low Reynolds number at which they move, thus conserving their energy. As larval anchovy grow beyond a critical size of about 5 mm, they change to a beat and glide mode of swimming which Weihs has demonstrated to be more efficient for these sizes and beyond.

Weihs also undertook a search to explain swimming in yolk-sac larvae which do not breathe actively or feed and thus do not seem to have a reason for moving. In a combined theoretical and experimental study, it was established by Weihs that the larvae swim for a combination of two reasons: 1) to control their depth since they would sink otherwise and 2) to increase oxygen transport by convective diffusion.

Another of Weihs' projects dealt with the feeding behavior of fish. Here a computer model of the suction feeding process was set up to predict feeding distances and success rates. An interesting "spinoff" of this work was the calculation of the volume samples by plankton samplers which were designed at the SWFC through use of the same computer program.

Still another study focused on the distribution of eggs and larvae in spawning areas, with the purpose of arriving at a correlation between the number of eggs picked up in samplers and the actual number of eggs.

This research has not yet been written up for publication since the data required for verification of some of the model's predictions are not yet available.

Weihs also turned his expertise to the swimming energetics of porpoise. With Dr. D. Au of the La Jolla Laboratory, he collaborated on a study of the rapid swimming of dolphins. He also served as a consultant to Center researchers carrying out various programs such as tagging of porpoise.

In collaboration with Fishery Biologist Geoff Moser, Weihs completed an examination of fish species which have larval stages with eyes on long stalks which disappear as the fish grows. Weihs and Moser suggest that a possible reason for this strange development is improvement of foraging efficiency.

According to Dr. John Hunter, who was the senior researcher most closely associated with Weihs' one-year tenure as the NOAA Post-Doctoral Fellow, this remarkable record of productive research will result in the publication of at least seven scientific papers.

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Dr. Paul W. Webb, the 1979-80 NOAA-NRC Postdoctoral Fellow, arrived at the Southwest Fisheries Center on August 23. He has spent the past month learning the techniques for taking movie film of swimming larvae, develped by Dr. J.R. Hunter and J. Taylor. Webb has assembled the apparatus to study the acceleration capabilites of larval anchovy, pertinent to their feeding tactics and predator avoidance. R. Carolla, an intern from Southampton College, is assisting Webb with the project.

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Dr. R. Lasker, Leader of the Coastal Division, and Jack Brown, Electronics Engineer, were aboard the NOAA research vessel, Jordan, at various times during September to test the Free-Fall Particle Counter (FFPC). Lasker reports that the new winch built by Scripps Institution of Oceanography for the FFPC worked well after a slight modification to make it free wheel easily and the addition of a clutch. Repeated casts were made and particle concentrations at 0.2 m intervals were displayed on the video screen of the FFPC, followed by automatic data transfer to the HP9825 computer. R. Methot, UCSD graduate student who is working with Center scientists, provided needed alterations to the HP9825 computer program translating the data to graphics and a digital readout. Thus all the data on particle concentration with depth in real time was available on shipboard.

Lasker intends to use this instrument for surveys of larval fish food particles with depth in relation to oceanographic conditions during future CalCOFI cruises.

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As members of a special National Science Foundation oversight committee for Biological Oceanography, Drs. Lasker and Paul Smith traveled to Washington September 18-21. With Dr. Galen Jones of the University of New Hampshire and Dr. Warren Wooster of the University of Washington, they reviewed NSF grant procedures and program management. A report with their findings has been transmitted to the Executive Committee on Ocean Science of the NSF.

Oceanic Fisheries Resources Division

TUNA RESOURCES PROGRAM

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

James Renner, Fishery Biologist at the La Jolla Laboratory, reports that foreign import samples total about the same as last year at this time. Atlantic-caught tunas transshipped to Puerto Rico have been sampled routinely for biological information by Eugene Holzapfel, Technician, of the La Jolla Laboratory stationed in Mayaguez since March 1975. Data on fork length, weight and species composition samples collected during the period January through September 1979 are as follows:

Species	Gear	No. of samples	No. of fish sampled	Tonnage sampled (MT)
Yellowfin	Baitboat	33	1940	551
Skipjack	Baitboat	18	911	2457
	Purse Seine	3	151	1338
Bigeye	Baitboat	27	1282	278
Albacore	Longline	2	81	541
TOTAL		83	4365	5165

Weather and XBT Observations Reported by Tuna Vessels

During August 1979, 19 tuna seiners contributed synoptic weather data to the NMFS FAX Advisory Program. 228 weather and 6 XBT observations were reported via Commerce-licensed radio station, WWD. The table below lists program participation during August 1978 and 1979.

	August 1978	August 1979
Number of vessels with equipment	50	44
Number of vessels reporting	27	19
Number of weather observations reported	238	228
Number of XBT observations reported	29	6
Total Observations	267	234

Leading program participants this month were the captains and crews of the tuna seiners, Scorpio I, Marietta, Claudia B, and Christina C. The staff of the FAX thank these and all other contributing vessels.

Center Wide Tuna Research Planning Workshop Held

Scientists from the Tuna Resources Group attended a Center-wide workshop on Tuna Research Planning in San Clemente, California Septemer 10 to 13. Dr. Wes Parks, Tuna Resources Leader, attended the conference with staff scientists who presented reports on world tuna stocks: Dr. Norm Bartoo presented reports on North Pacific albacore and North and South Atlantic albacore, Ronald Rinaldo on eastern Pacific yellowfin and Atlantic skipjack, Atilio Coan, Jr. on Atlantic yellowfin and eastern Pacific yellowfin, Earl Weber on Atlantic bigeye; James Squire, Jr. on Pacific swordfish. N. Bartoo, R. Rinaldo and J. Squire served as rapporteurs.

MARINE MAMMAL BIOLOGY AND TECHNOLOGY (MMBT) PROGRAM

Dynamics of Tuna Purse Seine Studied in Local Waters

During the last two weeks of September, a major portion of the MMBT staff led by James Coe, Fishery Biologist, was at sea aboard the chartered purse seiner M/V Maria C J. During this period, the scientific party made an extensive series of observations on purse seine dynamics as part of continuing research to reduce porpoise mortality through improved gear and methods. Of particular interest was the formation of the "stern-sway" phenomenon in which webbing is forced by water pressure during backdown into a canopy under which dolphins may become trapped. Scuba divers entered the net on most dives to observe and record the movement of webbing under different conditions. Prior to the sea trials, the purse seine had been marked with highly visible streamers along the webbing bars from corkline to chain in several places. These markings allowed the divers to keep track of what was happening to the webbing shape at different stages in a set. One observation was that in this net no ridge formed in the zipper-line area. A zipper-line ridge, sometimes 30-40 feet high, has been observed in several other nets and may contribute to dolphin mortality. In addition to the above, the scientific party made measurements of tensions at various points and times in the sets and experimented with different tie-down points for backing down.

Soviet Scientist to Work at Center for Three Months

Dr. Anatoly S. Sokolov, Director of the Functional Morphology Department, Zoological Institute of the Academy of Science, Leningrad, USSR, has arrived at the La Jolla Laboratory for a stay of 3 months under the auspices of the Life History and Systematics Project. During this period, he will spend most

of his time working with Dr. William Perrin, Program Leader, on the morphology and morphometrics of organs for swimming (musculature and the cardiovascular and respiratory systems) in 7 species of tropical Pacific dolphins. Dr. Sokolov visited the Southwest Fisheries Center previously in 1975 and 1977.

Hubbs/Sea World Research Institute to Study Population Biology and Ecology of the Pacific Whitesided Dolphin

The NMFS Southwest Fisheries Center has awarded a contract to the Hubbs-Sea World Research Institute for a study of the population biology and ecology of the Pacific whitesided dolphin, Lagenorhynchus obliquidens, in the Northeastern Pacific. During the contract period, the government has specified that Hubbs-Sea World assemble and review the available technical literature on the whitesided dolphin, and prepare an annotated bibliograhy. In addition, the contractor is to assemble from all available sources, published and unpublished, sighting records and effort information, and will inventory specimens collected from the study area for biological study.

The contractor will also participate in aerial and ship surveys of distribution, movements and densities of whitesided dolphins in California current area. The surveys will be funded by NMFS and conducted by NMFS and California Department of Fish and Game. Two 30-day surveys are planned. Finally, Hubbs-Sea World personnel will analyze all distribution and abundance data and prepare a technical report on distribution, abundance and migration, in collaboration with NMFS scientists, including summaries and charts of sightings and effort data.

Chromosomal Banding Study Begins

A contract has been let by the NMFS to Utah State University to study chromosomal banding in porpoise as a technique for defining subspecific units of pelagic porpoise in the eastern tropical Pacific. Existing stock boundaries have been determined based on morphological evidence. The addition of a second line of evidence for differences among stocks will assist in confirming or denying the validity of the present stocks.

University of Oklahoma to Re-examine Geographical Variation in ETP Dolphins

A contract has been let to the University of Oklahoma to do an analysis of geographical variation in skeletons of spotted and spinner dolphins from the eastern and tropical Pacific. The analysis will use multivariate techniques and much larger samples than were previously available. For example, the analyses done by Dr. Perrin and others earlier were based on a few hundred specimens. More specimens have accrued over the year, and at present there are over 1000 spotted dolphin specimens available for use in the analysis.

Arrangements Underway for Porpoise Tracking with TIROS Satellite

Fishery Biologist Jacqueline Jennings attended the User's Conference of the ARGOS satellite system on September 13-14 in Lanham, Maryland. A proposed Memorandum of Understanding was discussed under which Service ARGOS will agree to charge federally-funded U.S. users a group rate of $8.22 per transmitter per day of operation (the usual fee per day of operation is $20.00). Service ARGOS provided Jennings with preliminary results of tests which they had agreed to conduct to determine the feasibility of using a transmitter with their TIROS satellite similar in power to the one being developed by the Center for use with NASA's NIMBUS satellite. Results are encouraging, according to Jennings and an application was submitted for experimental use of TIROS for additional tests.

Jennings plans to use the satellite(s) to track porpoise equipped with a radio transmitter pack. Most of the projects currently using the ARGOS system involve buoys or balloons. The U.S. Coast Guard is using transmitters to track icebergs and others are using them to track sailboats during special sailing events. The only two other animal tracking projects have not yet begun to use ARGOS. The Fish and Wildlife Service polar bear tracking project is currently using the NIMBUS-6 satellite. A Mr. Pride of England hopes to use ARGOS next year to track basking sharks.

MARINE MAMMAL ASSESSMENT AND MONITORING PROGRAM

Drafting of SOPS Workshop Report Continuing

The staff of the Marine Mammal Assessment and Monitoring Program continued work on estimates of population size and mortality as a result of discussions held at the Status of Porpoise Stocks (SOPS) Workshop August 27-31, 1979. The refined estimates will be incorporated in the SOPS Workshop report. Dr. Tim Smith of the La Jolla Laboratory, chaired the SOPS meeting and is supervising the preparation of the workshop report.

Coastal Marine Mammal Survey Underway

The first coastal marine mammal survey in the California Current conducted by the Southwest Fisheries Center began on September 26 aboard the NOAA research vessel, David Starr Jordan. Biological Technician Tom Duffy of the La Jolla Laboratory is the scientific leader on the 30-day cruise whose objective is to study cetaceans, pinnipeds and sea birds in coastal and offshore waters extending from the California-Oregon border to southern Baja California. Sightings of mammals and birds will be recorded along 27 planned transects that cross the California Current. An inner series of these transects begins approximately 15 miles offshore, surveying the continental shelf. An outer series of transects will be made to survey the slope and deeper waters to approximately 200 miles offshore.

This survey is the result of a series of meetings held early in 1979 between the state of California and federal (including the NMFS Southwest Fisheries Center) agencies with responsibilities for assessment of coastal marine mammals relative to interactions with fisheries and industrial developments in the coastal zone.

The distribution and abundance of mammals in the California Current is inadequately known, particularly the size of populations and their extent seaward of the continental slope. A similar survey is planned for June 1980.

Cooperating in this study are California and Mexico, the Northwest and Alaska Fisheries Center, the Bureau of Land Management and Hubbs-Sea World Research Institute (HSWRI). The surveys are intended to complement similar coastal zone studies being carried out by the University of California at Santa Cruz and HSWRI. Cooperative researchers presently aboard the Jordan include a team from the Scripps Institution of Oceanography studying the relationship of surface chlorophyll distribution, via satellite, to eddy systems and associated biological activity, and Dr. R. Clarke, cetologist, from the Autonomous University of Baja California at Ensenada, Mexico.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Northward Trend Toward Occurrence in Shallower Water Noted in Certain Hawaiian Reef Fishes

Among a number of Hawaiian reef fishes there is a trend toward occurrence in shallower water at more northern sites in the archipelago. This is one of the findings made by Dr. Edmund S. Hobson, Leader of the Fish Communities Task, and Fishery Biologist Tony Chess, during their work in the Northwest Hawaiian Islands this month. For example, the angelfish Genicanthus personatus (first described just four years ago) has been known from just a few specimens taken around the major islands, all from deep water, but this species is numerous at Midway and Kure Atolls in some locations as shallow as 15 m. The boarfish, Histiopterus acutinostri (Figure 1), has a similar distributional pattern. Boarfishes are typical of cooler waters--H. acutirostri is common in Japan. So like the spotted beakperch, Oplegnathus insignus, also numerous in Japan, and found earlier to be numerous at Midway and Kure, H. acutirostri may have arrived in Hawaii from the northwest rather than from the southwest, as apparently have most other species of Hawaiian fishes.

Other Hawaiian fishes that occur in greater numbers in shallower water around the Northwestern Islands include the holocentrid, Ostichthys pillwaxi, the morwong, Goniistius vittatus, and the hogfish, Bodianus bilunulatus.

Life History Studies on Rockfishes Aided by Participation in Cruise of Research Vessel, Alaska

Fishery Biologist Tina Echeverria participated in a cruise on the California Department of Fish and Game research vessel, Alaska, September 21-28, 1979. The biologists tagged and released rockfish caught in shallow waters between Monterey and Morro Bay. Besides assisting California Department of Fish and Game personnel, led by Robert Lea of the Department's Monterey Laboratory, Echeverria collected and processed a numer of rockfish specimens for her life history studies. She has had difficulty in obtaining adequate numbers of shallow water specimens for her studies and the cruise provided an excellent opportunity to fill in some of the gaps in her data.

Meeting Considers the Brown Pelican/ Northern Anchovy Problem

Dr. William H. Lenarz, Leader of the Rockfish Analysis Task, participated in a meeting on the brown pelican/northern anchovy problem in Sacramento, California on September 7. A group composed of Dr. Lenarz, R. Mallette, Wildlife Biologist with the California Department of Fish and Game, and Dr. R. Schreiber, Ornithologist with the Los Angeles County Museum, has been formed by Gary Smith of the NMFS Southwest Region to conduct a technical review of the pelican/anchovy problem. Background information on the problem, as well as possible courses of action for the team, were discussed at its first meeting. A meeting is scheduled for October with scientists involved in research on the problem to obtain more information.

Revisions of Groundfish Management Plan Considered

A joint meeting of the Groundfish Plan Development Team, and members of the Advisory Panel and Scientific and Statistical Committee, was held at the Tiburon Laboratory on Septemer 20, with Dr. Lenarz participating. The meeting was held, as requested by the Pacific Fishery Management Council, to consider minor revisions of the Groundfish Plan for inclusion in the next draft. The draft is scheduled to be presented at the November meeting of the Council for release for public hearings.

FISHERIES DEVELOPMENT INVESTIGATION

Shark Age Verification Study Continues

Field tagging of leopard sharks (Triakis semifasciata) was completed by mid-September, with 447 additional sharks tagged, injected with oxytetracycline (OTC), and released into San Francisco Bay off Hunters Point.

This makes a total of 942 Triakis tagged since the end of July. Fishery Biologist Susan Smith of the Tiburon Laboratory is injecting OTC into tagged Triakis to introduce a fluorescent mark of known date into the vertebral centra, which when examined from long-term recaptures, will help to determine whether the rings on the centra are annual and thus useful for aging.

During the nine weeks of long-lining, 2,021 elasmobranchii were captured, comprising 97 percent of the total catch. Of these the most common were Triakis (47 percent), brown smoothhounds (Mustelus henlei (42 percent), and bat rays (Myliobatis californica (8 percent). In addition, seven small seven-gill sharks (Notorynchus maculatus), five soupfins (Galeorhinus zyopterus), and one spiny dogfish (Squalus acanthias) were taken. Most all were taken in water 12-18 meters deep.

A surprisingly high mean catch rate of 45.5 elasmobranchii per 100 hooks--and a mean catch rate of 21.9 Triakis per 100 hooks--indicates a sizable shark population in the Hunters Point area, according to Smith. Also, not one tagged shark was ever recaptured during a month and one-half of fishing, although one tagged fish was returned on September 17 by an angler who caught the fish from shore just south of the tagging area.

Recreational Fisheries Improvement

Fishery Biologist Roger Green reported a moderate outbreak of disease in the salmon pens at the Tiburon Laboratory with increasing mortalities at about mid-month. A sample live, symptomatic fish was taken to the California Department of Fish and Game's Pathology Laboratory on Septemer 13 for diagnosis and recommendations for treatment. A final diagnosis will be made pending the outcome of several bacterial cultures started at the Pathology Laboratory. In the meantime, a 10-day treatment of sulfamethazene in the food was started. Mortalities appeared to be decreasing at month's end.

A weight sample taken Septemer 14, 1979 showed that the young salmon had grown to a size of 18 grams. The fish were delivered August 20-22, 1979, at an average size of 13 grams.

PHYSIOLOGY INVESTIGATION

Final Report Prepared on Pollutant Studies on Striped Bass

The final report of Tiburon Laboratory's Marine Sanctuaries Act Contract was prepared for the Office of Marine Pollution Assessment (RD) by Dr. Jeannette A. Whipple, Maxwell Eldridge, and Nina Hirsch. The report covered research conducted within the last six months which addressed the effects of pollutants on San Franscisco Bay/Delta striped bass (Morone saxatilis).

Research in three different areas was done during this period. Adult fish, in spawning and post-spawning condition, were collected from several locations throughout the estuary. Extensive pathological autopsies were performed on each fish with the intent of determining the condition of the fish. An experiment on the effects of long-term chronic exposure of benzene to juvenile striped bass was conducted. Three-year-old fish caught in the Delta were acclimated in the laboratory for three weeks, then exposed to benzene at 100 nl l^{-1} for 28 days in a specially designed and constructed continuous exposure apparatus. Fish were sacrificed at 14 and 28 days and autopsied. Samples from this experiment are still being analyzed and data collected. During the spawning season, field-caught fish were artificially induced to spawn and their newly fertilized eggs and resultant larvae exposed to low-level concentrations of C^{14}-labelled benzene. Preliminary results of those experiments were given in the August 1979 Monthly Report of the Southwest Fisheries Center. It is hoped that the contract will be renewed as further experiments are planned which will examine other life stages, sexual conditions, food chain interactions, and effects of pollutants which have been found in adult tissues.

A 24-hour experiment on the uptake and accumulation of C^{14}-benzene by Artemia salina was run by Maxwell Eldridge and Pete Benville. The purpose was to determine the rate and degree of uptake of benzene by Artemia under conditions similar to earlier larval striped bass experiments. Feeding striped bass larvae, aged 9 to 30 days after fertilization, accumulated benzene faster and to higher levels than starved cohorts. Tissue benzene concentrations of starved uptake rates were described best by $y = 8.06528 e^{(.39027x)}$ and fed larvae by $y = .0037 (x^{7.00610})$. These rate differences were highly significant and prompted this Artemia experiment. Results are not yet available, but they will be combined with the larval experimental results for a more comprehensive understanding of the overall effects of low-level benzene contamination.

SOUTHWEST REGIONAL DATA MANAGEMENT AND ADP OPERATIONS

Reports Prepared for San Diego Unified Port District, Information Needed to Plan Vessel Slip Space

Oden Burris, Computer Programmer, completed the reports from the 1978 Vessel Registration file for William Briggs, Planner for the Port of San Diego Unified Port District. Briggs had received permission from the California Department of Fish and Game to use the vessel information from the enforcement system for the planning of vessel slip space in the San Diego area. The reports consisted of four tables, one for each vessel type: 1) sport fishing vessels, 2) trailerable boats, 3) tuna seiners and 4) market fishing and oceanographic research vessels. Each table listed the vessels by length, weight, year built, gear codes and days fished.

Implementation Proceeds Slowly on Coastwide Data System

Burris continued to generate tapes for implementing the Coastwide Data System. The system will contain vessel and vessel landing information from the states of California, Oregon and Washington for the years 1974, 1975, and 1976. The vessel tape files from Washington, Oregon and California have been merged on the Burroughs system and were sent to the INFONET system for loading onto the vessel data base file. Progress is slow for the merging of the commercial landings tapes from the three states. Part of the delay is attributed to the correction of numerous errors on each state's tapes, such as invalid species codes, non-conformance of ship's document number to the specified format and tape parities errors. Another reason for the slow progress is that the programs can be executed only during off-peak hours (night runs) because of the volume of records. For the commercial landings data there are from 2.5 to 3 million records.

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Dorothy Roll, Systems Analyst, reviewed the documentation package for the porpoise edit software package. In addition to the set of 16 programs submitted in August, ten programs were submitted in September to the Porpoise Data Management Group. The final set of five will be submitted in early October.

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The Southwest ADP Requirement is in the final stages of typing. The study will be forwarded to the SWFC Laboratory Director and Division Chiefs for review in October 1979. The Requirement Study will recommend how the SWFC and SWR should operate for the next five years in the area of computer support.

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During September, the plotting system developed by Potomac Research, Inc. was turned over to the Marine Mammal Assessment and Monitoring Program for operation. The system takes geographic sightings and related data and generates various geographic displays. The plotting system is intended for use with the International Whaling Commission data and porpoise data. The system includes three main programs and four subroutines.

October is Target Date for
PACES Operation

PACES (Pacific Area Cooperative Enforcement System) is a cooperative enforcement system among the SWR, SWFC and California Fish and (CF&G). PACES contains information on commercial fishing vessels, sightings, boardings, patrols and offensive investigations. Work started on modifying PACES to reflect new requirements for FY 80. The input programs for vessel registrations and fishing licenses will be modified and the query subsystem will be expanded to reflect new requirements. Data Systems Manager Fred Kellenberger attended a meeting with the SWR and CF&G in Long Beach, California to plan the implementation of PACES in FY 80. It is envisioned that PACES wil be operational by October 31, 1979.

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The Billfish Data Base System is near completion. The system will contain recovery data and releasing data on billfish. The system consists of three data bases - address, release and recovery. All three data bases have been designed and created. Work has started on writing the user manual and external documentation. The system should be completely implemented by mid-October 1979.

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During September, the CalCOFI applications programs were completed for the ORION (Oceanographic Research Interactive Onboard Network) project. The programs were implemented on the HP9825 computer at the SWFC. The CalCOFI system will be tested and implemented on the NOAA David Starr Jordan during the December 1979 cruise. Draft documentation including user manual and external documentation have been completed. The primary CalCOFI users are presently reviewing the draft documentation. A meeting was held on September 14 with Fletcher Riggs and George Liao of the Honolulu Laboratory to discuss compatability of the ORION system with the future computer system that will be installed on the R/V Cromwell.

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On Wednesday, September 19, a computer users meeting was held in the La Jolla Laboratory. Mr. Jerry Fitzsimmons, consultant at the UCSD's Computer Center, reviewed the UCSD VAX computer system and the Burroughs 7800 system. The VAX is a host computer which replaces the CDC 3600 and the Burroughs 7800 replaces the B6700.

MISCELLANEOUS

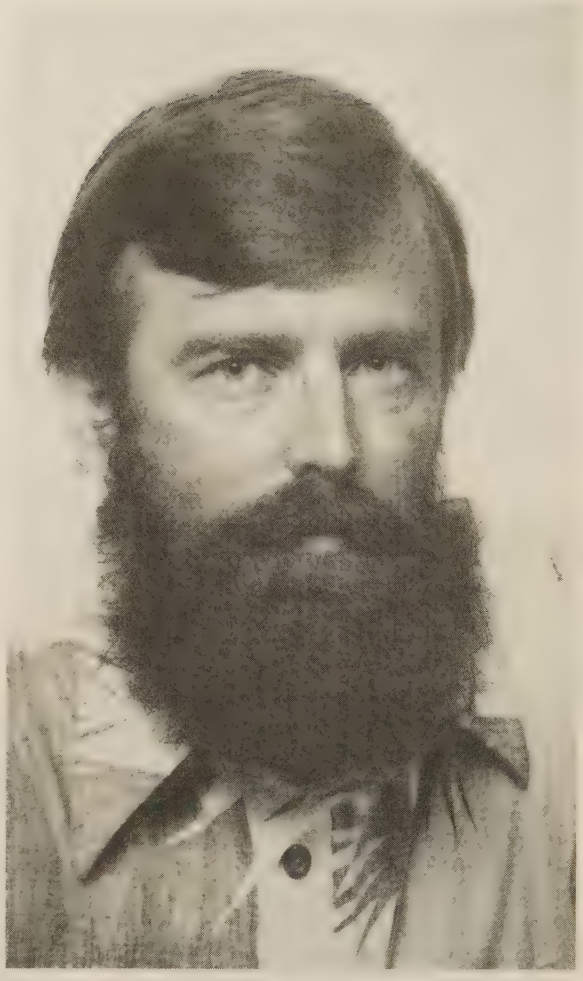
HONORS AND AWARDS

At a second award ceremony of the year at the Southwest Fisheries Center on September 5, the following employees of the La Jolla Laboratory were honored by Director Izadore Barrett. Shown from left to right in the accompanying photograph are: Dr. Albert Myrick, Outstanding Performance Rating, Izadore Barrett; Marleen DiBona, Outstanding Performance Rating; Gail Theilacker, Cash Award; Susan Covey, Quality Step Increase; David Holts, Quality Step Increase; Dr. Tim Smith, Outstanding Performance Rating; Priscilla Sloan, Outstanding Performance Rating, Fred Kellenberger, Outstanding Performance Rating; Dr. William Perrin, Outstanding Performance Rating, Jacqueline Jennings, Cash Award; Frank Ralston, Cash Award; Kate Coleman, Quality Step Increase; and Pete Paloma, Cash Award.

Not shown are James Coe, Quality Step Increase; Bonnie Neece, Cash Award, Barbara Sumida MacCall, Special Achievement Award; Bobbie Watkins, Outstanding Performance Rating; Sue Steele, Cash Award.

William Perrin Receives NOAA'S Highest Scientific Award

A personal telephone call of congratulations from Assistant Administrator for Fisheries Terry Leitzell was the first notification received by Dr. William Perrin that he was the recipient of the NOAA Scientific Research and Achievement Award, the highest scientific award of the agency. On October 5 Perrin will receive a plaque and $1,000 from NOAA Administrator Richard Frank in ceremonies in Washington, D.C. for his landmark research on tropical porpoises.



Perrin was among the first to recognize the threat to the porpoise populations associated with the yellowfin tuna purse seine fishery in the eastern tropical Pacific and has been a leader in the creation of the U.S. government-sponsored research program which began in 1969 at the La Jolla Laboratory. With the passage of the Marine Mammal Protection Act of 1972, the program expanded greatly and as its first priority undertook to reduce incidental porpoise mortality to a level approaching zero as quickly as possible. At the same time government researchers intensified efforts to establish information on the status of the porpoise populations in the eastern tropical pacific.

At the outset of the program most of the effort and research funds were channeled into development of improved fishing gear and techniques since these appeared to offer the greatest promise of speedy and practical short-range reduction of porpoise mortality. Now, some 7 years later, there has been developed and tested under actual fishing conditions, with the help of the U.S. tuna industry, an array of innovative gear and modified fishing techniques which has been responsible in substantial measure for the dramatic decrease in porpoise mortality due to fishing.

Widely acknowledged as a world leader in cetacean biology, Perrin's research has concentrated on developing biological information to be used in assessing the status of the various porpoise populations. His work has

provided the basis for recognizing several stocks of the two major porpoise species which are indicators and aggregators of tuna, and for a better understanding of the unique bond between the porpoise and the tuna. He has also studied the role of parasitism in the life histories of the porpoise, their food habits, and reproductive capacities.

Perrin received his Ph.D. in zoology from the University of Calfornia at Los Angeles in 1972, having previously earned a B.S. in biology with high honors from San Diego State University. He has published 32 scientific papers which constitute a broad advance in knowledge of the pelagic cetaceans.

Perrin is a member of the American Society of Mammalogists and has served on numerous scientific committees concerned with the study and preservation of marine mammals.

The NOAA Scientific Research and Achievement Award given to Perrin is the first to a member of the staff of the Southwest Fisheries Center.

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At a general staff meeting at the Honolulu Laboratory on September 26, Laboratory Director Shomura recognized the following employees for outstanding performance or for sustained superior performance during the rating year April 1, 1978 through March 31, 1979.

Outstanding Performance:	Melvin J. Dutro, Sr. Thomas K. Kazama
Sustained Superior Performance:	Victor A. Honda Robert L. Humphreys, Jr. Paul M. Shiota Darryl T. Tagami Carole A. Yukihiro

Although the letters of commendations had not arrived, it was also announced that the following employees also received outstanding performance ratings: Michael F. Adams and Elizabeth F.Y. Young.

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At the Tiburon Laboratory, the Director honored Dr. Jeannette A. Whipple, Outstanding Performance Award and Tina Echeverria, Outstanding Performance Award and Sustained Superior Performance.

PUBLIC RELATIONS

September 13 - Biologist Susan Smith and Lieutenant Patrick Rutten of the Tiburon Laboratory, and Jean Lestanguet, a member of the San Francisco Tyee Club, were featured on KGO television during the 5:00 p.m. news program. A television camera crew had previously accompanied them on a leopard shark tagging trip and the resulting footage, which included an interview of Smith, was broadcast.

26 - Professor Charles Jerde of Mesa College in San Diego brought students from his class in biological oceanography to the Center for a lecture by Dr. Michael Laurs on present trends in oceanography.

SEMINARS

September 7 - Tom Jagielo of the Northwest Region foreign fishery observer program made a slide presentation of his observations on a Japanese mother ship in the Bering Sea crab fishery.

TRAINING

Tiburon Laboratory

September 10-11 - Walburga Giguere - Managing Your Building Maintenance Dollar, California State University, School of Business and Public Administration, Sacramento, CA.

14-15 - Maureen Woods - Anglo-American Cataloging Rules and Edition, Library Institute.

VISITORS

Honolulu Laboratory

September 24 - John P. Wise, Office of Policy and Planning, and James F. Murdock, Office of Utilization and Development, NMFS, Washington, D.C., visited Shomura to discuss their mission to evaluate the Pacific Tuna Development Foundation.

26 - David Tsutsumi, Kuruma International, Honolulu, visited Yoshida to discuss marine shrimp culture, particularly the culture of the Hawaiian penaeid shrimp, Penaeus marginatus in shoreside saltwater ponds.

La Jolla Laboratory

September 10 - Jennifer Purcell, University of California, Santa Barbara, Dept. of Biological Sciences, Santa Barbara, CA.

11 - Clarence Pautzke, Pacific Marine Fisheries Commission and Norm Sondak, San Diego State University.

14 - George Liao and Fletcher Riggs, Honolulu Laboratory.

25 - Gary Schevill, University of Oklahoma, Norman, OK.

28 - Gary Worthen, Utah State University, Logan, UT.

Pacific Environmental Group

September 20 - Ms. Valerie Loeb, Scripps Institution of Oceanograhy.

Tiburon Laboratory

September 5 - Curtiss O. Davis, Tiburon Center for Environmental Studies, Tiburon, CA.

- Larry R. Green, KCBS Radio, San Bruno, CA.

12 - Marvin Jung, State Water Resources Control Board, Sacramento, CA.

14 - Richard S. Shomura, Director, Honolulu Laboratory, NOAA, Honolulu, HI.

17 - Susan C. Ferguson, California Assembly Committee on Water, Parks and Wildlife, Sacramento, CA.

- Ken Finney, California Senate Committee on National Resources and Wildlife, Sacramento, CA.

- William T. Davoren, U.S. Fish and Wildlife Service, Sacramento, CA.

- Philip Meyer, U.S. Fish and Wildlife Service, Sacramento, CA.

19 - John E. Bryne, U.S. Fish and Wildlife Service, Portland, OR.

20 - John Radovich, California Department of Fish and Game, Sacramento, CA.

26 - William T. Davoren, U.S. Fish and Wildlife Service, Sacramento, CA.

- Philip Meyer, U.S. Fish and Wildlife Service, Sacramento, CA.

- Terry Waddle, U.S. Fish and Wildlife Service, Sacramento, CA.

MEETINGS AND TRAVEL

Honolulu Laboratory

September 10-13 - George W.T. Liao, Fletcher V. Riggs, Dr. Jerry A. Wetherall, Marian Y.Y. Yong, Howard O. Yoshida, and Heeny S.H. Yuen attended the SWFC Tuna Research Planning Workshop in San Clemente (September 11-13).

10-22 - Richard S. Shomura was on travel status to (1) attend the SWFC Tuna Research Planning Workshop in San Clemente (September 11-13), (2) visit the Tiburon Laboratory (Septemer 14), (3) attend a ciguatera meeting at NMFS, Washington, D.C. (September 17-18), and (4) attend a small-scale fisheries stock assessment workshop at the University of Rhode Island, Kingston (September 19-21).

25-26 - Shomura and Uchida attended the Scientific and Statistical Committee (SSC) meeting of the Western Pacific Regional Fishery Management Council at the State Capitol Senate Conference Room 3.

27 - Shomura departed Honolulu for Apia, Western Samoa, coinciding with the scheduled stop of the Townsend Cromwell in Western Samoa. Shomura will be providing administrative assistance to the scientific field party on the Cromwell in their plans to install a series of fish aggregation devices around Western Samoa.

La Jolla Laboratory

September 10-17 - Dr. G. Moser was in Silver Spring, MD to attend a NOAA Workshop on Manganese Nodule Processing Impact and then traveled to West Yellowstone, Montana to attend the annual meeting of the American Fisheries Society where he presented a paper which was to be given by the late Dr. Ahlstrom

17-21 - Dr. R. Lasker and P. Smith were in Washington, D.C. to attend National Science Foundation meetings.

17-18 - Director Barrett was in Boulder, Colorado to attend a Workshop on Performance Appraisal for Senior Executives.

10-13 - I. Barrett, J. Carr, D. Mackett, L. Vlymen, N. Bartoo, A. Coan, E. Weber, G. Sakagawa, J. Squire, R. Rinaldo, and M. Laurs traveled to San Clemente to participate in the Southwest Center Workshop on Tuna Research Planning, organized by Mackett and Barrett.

12 - Dr. T. Smith was in Los Angeles to attend a class on computer language usage.

12-14 - R. Lynn traveled to Seattle, Washington to attend a planning meeting for Oceanic Fronts Experiment.

12-15 - J. Jennings was in Lanham, MD to attend a Argos User's meeting on the TIROS-N satellite.

20 - Fred Kellenberger traveled to CF&G office in Long Beach to discuss the implementation on PACES for FY 80.

Pacific Environmental Group

September 3-10 - Ms. Donna Mallicoate traveled to San Diego, CA. to board the David Starr Jordan. She assisted in biological and oceanographic research at sea.

Tiburon Laboratory

September 4-7 - Ed Ueber travelled to Vancouver, British Columbia, to attend the Workshop and General Meeting of the Western Association for Valuation of Ecosystems (WAVE). The main purpose of the meeting was to discuss resources and fisheries economics. Also,

at this meeting, Ueber was elected President of WAVE for the upcoming year.

13-14 - Ed Ueber travelled to Portland, Oregon to present the Groundfish Management Plan to the Pacific Fishery Management Council.

19 - Dr. John E. Bryne, Office of Biological Services, U.S. Fish and Wildlife Service, Portland, Oregon, and William T. Davoren, U.S. Fish and Wildlife Service, Sacramento, California, met with Norman J. Abramson at the Tiburon Laboratory to discuss Coastal Habitat Characterization Methods.

20 - Norman J. Abramson, William Leet, and Thomas Yocom attended the San Francisco Bay Research Coordination Workshop at the Sanitary Engineering Research Laboratory, Richmond, California. The workshop was sponsored by the Four-Agency Ecological Study Program (Department of Fish and Game, Department of Water Resources, U.S. Bureau of Reclamation, and the U.S. and Wildlife Service), which is developing a comprehensive plan to study and document Delta freshwater outflow needs of the San Francisco Bay ecosystem. This workshop provided a forum for exchange of information regarding the scope of ongoing studies in San Francisco Bay, and the opportunity to discuss and review the proposed Four-Agency Study.

26-28 - Dr. Jeannette A. Whipple travelled to Boulder, Colorado, to attend a NOAA Workshop on the review of applications for exemptions under Section 301(h) of the Clean Water Act. Section 301(h) allows municipalities with deep-water ocean discharges to apply for exemption of the requirement under the Act for secondary treatment of sewage effluents. Specifically, the purposes of this workshop were: 1) to review the background of the Section 301(h) program; 2) to define the timing and review procedures for application review; 3) to develop specific guidelines to ensure consistent internal agency review; and 4) to test the developed guidelines on one or two sample applications.

PERSONNEL ACTIONS

Honolulu Laboratory

September 9 - Jeffrey J. Polovina, Statistician - Career-Conditional Appointment.

- The following temporary employees completed their appointments or were terminated:

11 - Cora M. Nagamine, Data Transcriber.

18 - Linda L. Hudgins, Economist.

28 - Andrew J. Aldridge, Biological Technician (Fisheries).

- James C. Cooper, Biological Technician (Fisheries).

- George C. Evering, Biological Technician (Fisheries).

- Alan R. Everson, Biological Technician (Fisheries).

- Sharon D. Hendrix, Biological Aid (Fisheries).

- Linda C. Hubbell, Biological Aid (Fisheries).

- Barbara A. Jacques, Data Transcriber.

- Andrea S. Johnson, Time and Leave Clerk.

- Brian S. Joyo, Biological Aid (Microbiology).

- Henry M. Kishinami, Biological Aid (Fisheries).

- Brent M. Miyamoto, Computer Aid.

- Christine E. Siu, Biological Aid (Microbiology).

- Laurie L. Tsuji, Computer Technician.

- Marie S. Wallace, Clerk (Typing).

La Jolla Laboratory

September 7 - Scott Johnson, Biological Technician - Resignation.

9 - Joe Caruso, Computer Programmer - Promotion.

- Stephanie Revesz, Biological Technician - Temporary Appointment.

21 - Sue Steele, Budget and Accounting Technician - Resignation.

23 - Al Myrick, Wildlife Biologist - Promotion.

28 - Richard Harris, Technical Writer/Editor - Expiration of Appointment.

- Samuel Herrick, Industry/Economist - Career-Condition Appointment.

- Stephanie Revesz, Biological Technician - Expiration of Appointment.

- Harold Dorr, Biological Technician - Expiration of Appointment.

- Sandra Johnson, Biological Aid - Expiration of Appointment.

- Lonnie Dick, Biological Aid - Expiration of Appointment.

- Noelle Beerman, Statistical Assistant - Expiration of Appointment.

- Cynthia Thomson, Economist - Expiration of Appointment.

- Thomas Polacheck, Fishery Biologist - Expiration of Appointment.

29 - Lee Inness-Brown, Mathematical Aid - Expiration of Appointment.

- Morgan Busby, Biological Aid - Expiration of Appointment.

Pacific Environment Group

September 28 - June Favorite - Appointment Expired.

Tiburon Laboratory

September 9 - Peter B. Adams, Fishery Biologist - Promotion.

28 - Mark E. Kobe, Biological Technician - Termination.

- Donald A. Burns, Biological Technician - Termination.

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